SUBJECT: Proposed Sites For Orbiter Mission V: A Preliminary Report
Case: 232

DATE: May 15, 1967

FROM: Farouk El-Baz

ABSTRACT

Mission V, or Lunar Orbiter E, is intended to obtain high resolution photographs of selected scientifically interesting spots of the lunar surface, some of which would be considered as future manned lunar landing sites.

Seventy-seven (40 prime and 37 secondary) sites have been proposed for this mission. The salient characteristics of these sites are analyzed in this report, to help in the final site selection. The analysis is presented in both the detailed and the statistical forms.

Twenty sites are considered to be of significant value by the author, and it is suggested that they should be included in future planning. These sites contain all features and possible combinations represented in the seventy-seven proposed sites. However, their choice was based on general characteristics rather than unique properties.

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MEMORANDUM FOR FILE

As planned, Orbiter Mission V is intended to photograph specific sites of scientific value. The information to be recovered from the photographs is to be implemented in planning for future manned lunar landing missions. Since Mission V will follow Lunar Orbiter IV, the final site selection for the former will be influenced by results of the latter.

LOCATION

Forty prime sites and thirty-seven secondary sites (a total of 77) have been proposed for Mission V. Locations of these sites are indicated in Figure 1, where each site has a serial number and an abbreviated designation. This location map shows that the sites are distributed as follows:

	Primary	Secondary	Total
Upper left quarter of moon	14	9	23
Upper right quarter of moon	15	11	26
Lower right quarter of moon	8	8	16
Lower left quarter of moon	3	9	12
Total	40	37	77

Figure 2 is provided to facilitate locating these sites on existing lunar charts and geologic maps. The lunar surface is divided into "quadrangles", each of which carries the designation of its most significant feature. Two numbers appear with each of the quadrangles in this index map (of the front face of the moon). Numbers at the upper right corners represent designations made by the author for easy and quick reference. The first letter indicates whether the quadrangle is to the north or south of the equator; the second letter indicates how far the area is from this reference line; and the last number indicates whether the quadrangle is closer to the western or eastern edges of the moon.

Since this system was devised for personal use, the conventional LAC numbers (which were adopted by the U.S. Geological Survey and are internationally accepted) are given on the upper left corners of the quadrangles. The dashed areas in this index map represent those which are already published as lunar geologic maps by the U.S. Geological Survey.

CHARACTERISTICS

Table I includes a summary description of the major characteristics of the individual sites, with emphasis on the geological viewpoint.

The three sites which have no quadrangle numbers (43S,44S and 76S) in the table were proposed mainly to test the system capabilities since they are located close to either the lunar north pole or its western edge.

Representation of the characteristics of all seventy-seven sites in the form of cumulative graphs seemed demanding. This is mainly due to the fact that this type of representation is a useful tool in "screening", since only about 40 sites will be chosen for this specific mission.

Figure 3 illustrates the frequency of lunar features and structures in these sites, and Figure 4 is a summation of the major features and shows how frequently they occur in all the proposed sites.

Twenty sites (marked with black on the left edge of Table I) appear to include all the major features and their possible combinations represented in the 77 sites. To single out these 20 sites, a beginning was made with those that represent some aspect not represented in any other site (for example: Tycho, 8P, represents the only crater situated solely in highlands; Bond, 44S, is the only crater displaying polygonal morphology, etc.). After this all sites representing similar features were compared to pick up the ones which illustrate the most, or the more important features. This importance, of course, is a personal preference and could be debated. Therefore, some of these sites could be replaced by others showing similar features or characteristics. It is also important to state that the choice was made on the basis of general characteristics rather than unique properties.

CONCLUSION

The conclusions reached from analyzing the detailed characteristics of the 77 sites are:

1. On the one hand, some of the sites considered to be of secondary importance in the proposed list are underestimated; and on the other hand the characteristics of some of those listed as primary sites are overemphasized.

2. This type of analysis and classification will prove valuable in the final selection of sites for this and future manned lunar landing missions. To cite an example, Table I combined with Figures 1 through 4 should be useful in attempting to limit the sites to a specific region of the lunar surface, e.g., the equatorial belt.

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Attachments:
Figures 1-3
Table I

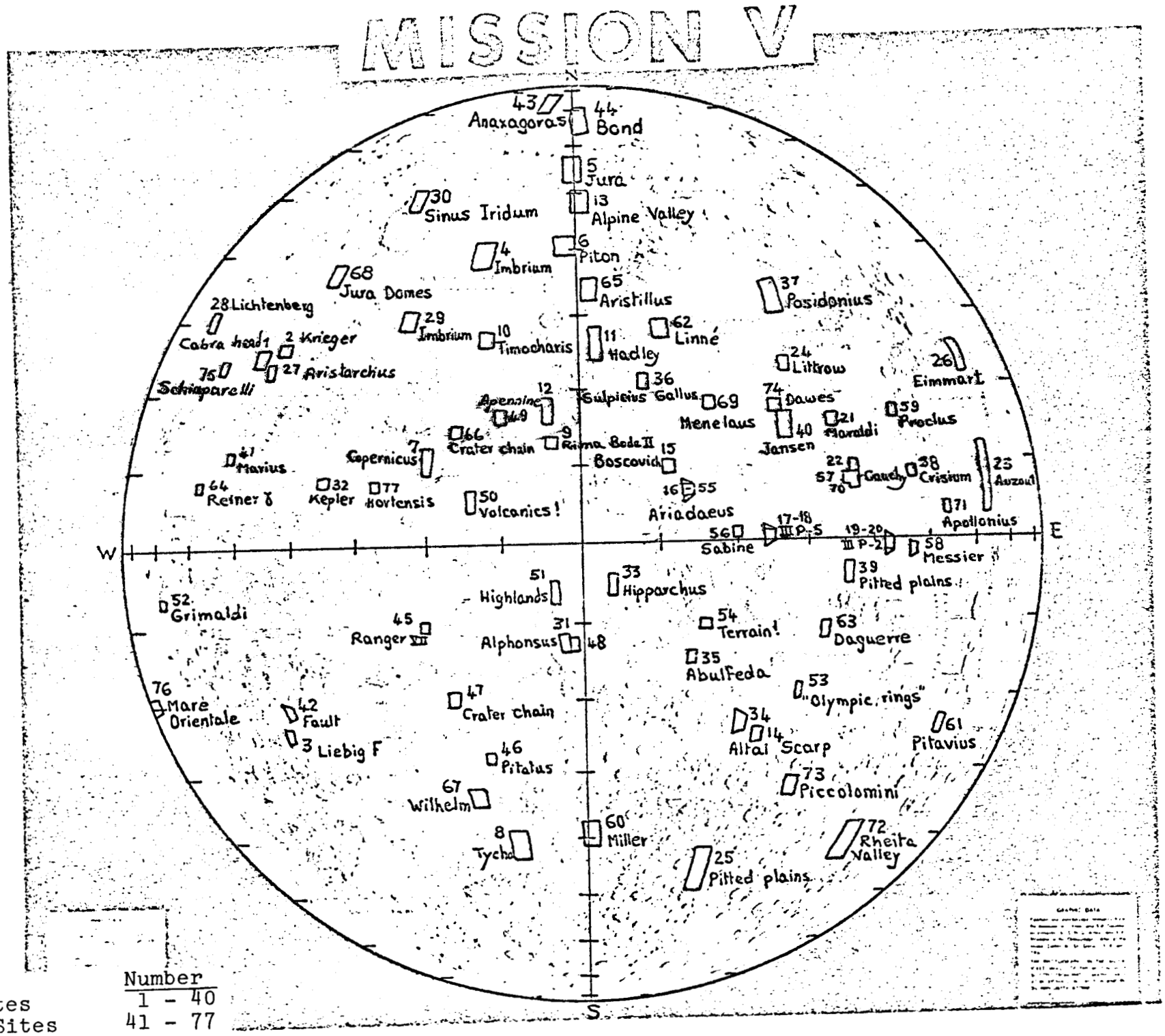

Figure 1.

SITES

	Number
Primary Sites	1 - 40
Secondary Sites	41 - 77

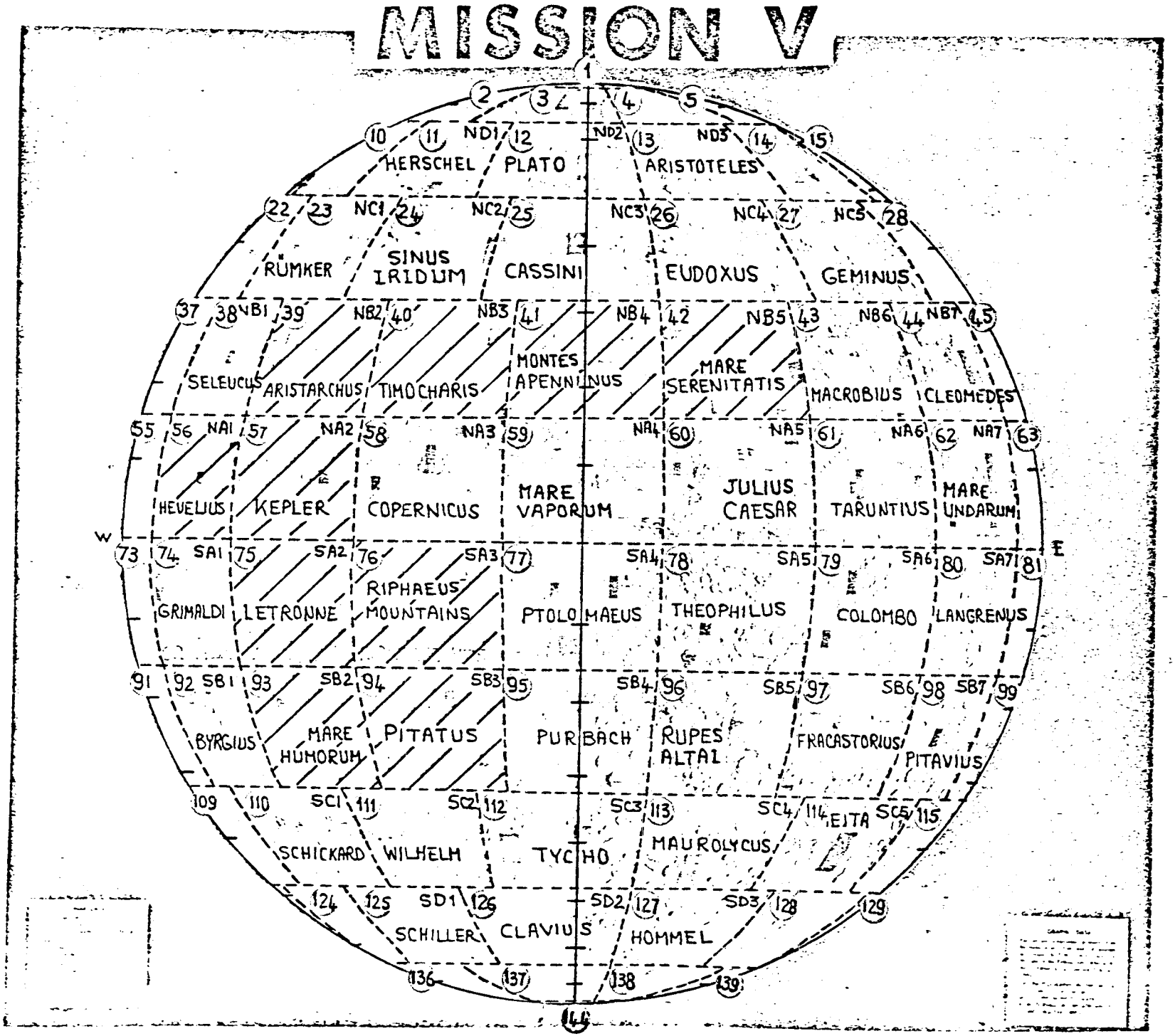

Figure 2.
U.S.G.S.
Lunar maps
☒ Published
(1) LAC No.

TABLE I. MISSION V; PRIMARY (P) AND (S) SITES.

MAJOR UNITS			MARIA					H.L.S.			CRATERS																		STRUCTURES												SPECIAL FEATURES!										
Serial No.	Quadrangle	Properties / Designation	Light	dark	smooth	rugged	ray material	plain-forming	rugged	pitted	single(s)	pair	chain(s)	circular	elongate	polygonal	in mare	in highland	inner halo	floor filling	stepped rim	ejecta-rim	fresh(young)	ghost	bedding	contacts	fault scarp(s)	displacement	slumpage	rille in mare	rille in h.l.	sinuous rille	valley(?)	ridge(s)	dome(s)	central peaks	summit crater	blocks	erosion	deposition	volcanism	flow boundary	color boundary	thermal anom.	radar anom.	geophysics !
1P	NB2	Cobra Head	X			X																							X			X																
2P	NB2	Krieger Area	X			X					X						X															X								X	X	X					
3P	SB2	Liebig F	X		X				X		X			X			X					X			X		X	X																			
4P	NC3	Imbrium Flows		X	X																																					X	X			X
5P	ND2	Jura Mountains							X																							X														
6P	NC3	Piton		X					X																X															X	X		X			
7P	NA3	Copernicus									X			X			X				X	X	X						X							X		X								
8P	SC3	Tycho							X		X			X				X	X				X																				X	X		
9P	NA4	Rima Bode II	X								X				X		X						X																	X			X			
10P	NB3	Timocharis									X			X			X					X													X	X									
11P	NB4	Hadley Rille			X			X	X																							X					X	X							
12P	NB4	Apennine Mts.							X																		X	X	X																
13P	ND2	Alpine valley							X																		X						X				X	X	X	X				
14P	SB5	Altai Scarp(V)	X			X			X																X		X	X	X																
15P	NA5	Boscovich									X			X			X			X					X		X		X								X								
16P	NA5	Ariadaeus	X					X																			X	X																	
17P	NA5	III P-5 (O)		X	X		X																																						
18P	NA5	III P-5 (V)		X	X		X																																						
19P	SA6	III P-2 (V)		X	X				X																																				
20P	SA6	III P-2 (O)		X	X				X																																				
21P	NA6	Maraldi Shield	X			X			X																	X									X					X					
22P	NA6	Cauchy Fault		X	X																				X		X																	
23P	NA7	Auzout		X	X				X																	X									X					X				
24P	NB5	Littrow Rilles		X	X						X			X			X		X						X					X										X				
25P	SC4	Pitted plains					X	X		X																														X					
26P	NB1	Eimmart		X	X				X																																				
27P	NB2	Aristarchus									X			X			X					X	X																		X				
28P	NB1	Lichtenberg		X	X		X															X				X																		
29P	NB3	Imbrium Flows		X	X																																					X				X
30P	ND1	Sinus Iridum							X											X		X						X									X								
31P	SA4	Alphonsus									X			X			X																	X		X					X				
32P	NA2	Kepler Area	X		X																													X											
33P	SA4	Hipparchus									X			X						X				X				X							X										
34P	SB5	Altai Scarp (O)	X			X			X																X		X		X																
35P	SA5	Abulfeda	X			X					X		X	X			X					X																				X			
36P	NA4	Sulpicius Gallus			X				X																					X	X										X				
37P	NC4	Posidonius									X			X			X			X	X			X					X												X				
38P	NA6	Crisium Rim		X	X				X													X				X				X															
39P	SA6	Pitted Plains						X	X	X																					X										X				
40P	NA5	Jansen		X	X						X			X			X			X				X																					
41S	NA1	Marius Hills		X	X																		X		X																			
42S	SB2	Fault		X	X				X														X				X	X					X											
43S		Anaxagoras					X				X			X										X																					
44S		Bond, W.C.									X					X	X					X							X								X								
45S	SA3	Ranger VII		X	X						X			X			X																												
46S	SB3	Pitatus									X			X			X			X		X																							
47S	SB3	Crater Chain		X	X								X				X					X																				X			
48S	SA4	Alphonsus									X			X			X		X			X	X																			X			
49S	NB4	Apennine Scarp							X																X		X	X	X																
50S	NA3	Volcanics		X	X								X				X								X										X			X			X			
51S	SA4	Highlands		X	X				X																		X		X									X						
52S	SA1	Grimaldi		X	X						X			X			X	X		X		X																X						
53S	SB5	Olympic Rings											X																												X				
54S	SA5	Ferrari-Dollond							X	X																												X							
55S	NA5	Ariadaeus	X					X																			X	X					X											
56S	NA5	Sabine		X	X							X		X			X																								X			
57S	NA6	Cauchy Dome	X		X																														X	X								
58S	SA6	Messier		X	X		X					X			X		X					X	X																					
59S	NB6	Proclus					X				X			X			X																	X										
60S	SC3	Miller										X						X				X																						
61S	SB7	Petavius									X			X			X					X												X		X								
62S	NB5	Linné	X			X					X			X			X						X						X												X			
63S	SA6	Daguerre	X	X	X												X				X		X																						
64S	NA1	Reiner γ	X			X					X			X			X																			X									
65S	NC3	Aristillus									X			X			X						X						X							X									
66S	NA3	Crater Chain			X		X	X					X				X																								X			
67S	SC2	Würzelbauer									X			X			X	X																				X						
68S	NC1	Jura Domes			X		X																												X									
69S	NB5	Menelaus	X			X			X														X			X				X					X	X					X			
70S	NA6	Cauchy Dome	X		X																														X	X	X							
71S	NA7	Apollonius I	X		X				X																					X									X					
72S	SC5	Rheita Valley								X	X																X	X					X								X			
73S	SB6	Piccolomini						X			X			X				X				X					X		X									X						
74S	NB5	Dawes			X	X					X			X			X		X			X	X																		X			
75S	NB1	Shiaparelli									X			X			X		X																						X			
76S		Mare Orientale			X	X																	X	X																				
77S	NA3	Hortensius			X	X					X																								X		X				X			

Frequency of Lunar features and structures in the 77 sites

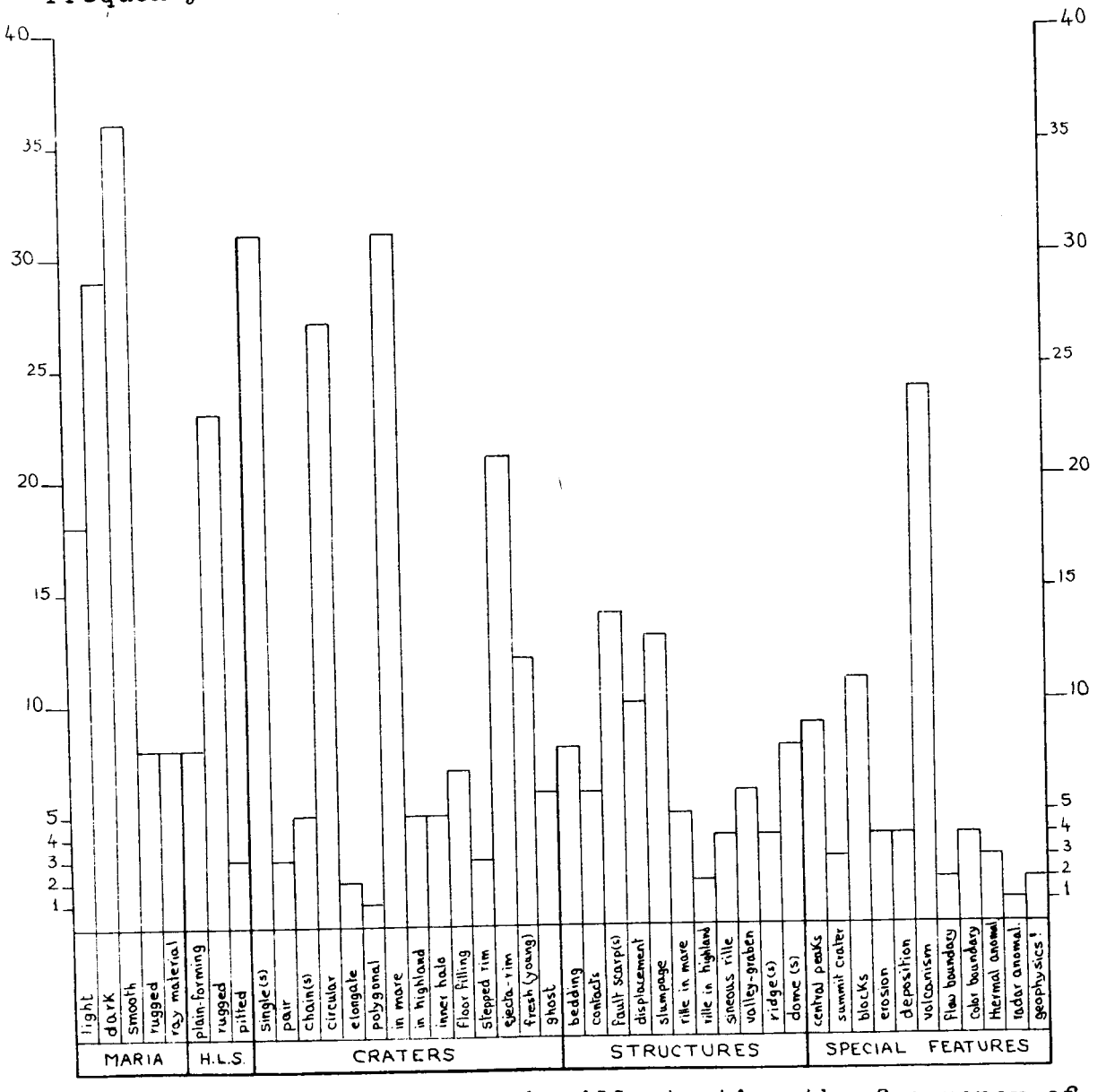

Figure 3. Cumulative graphs illustrating the frequency of Lunar features and structures in the seventy-seven sites listed in Table I.

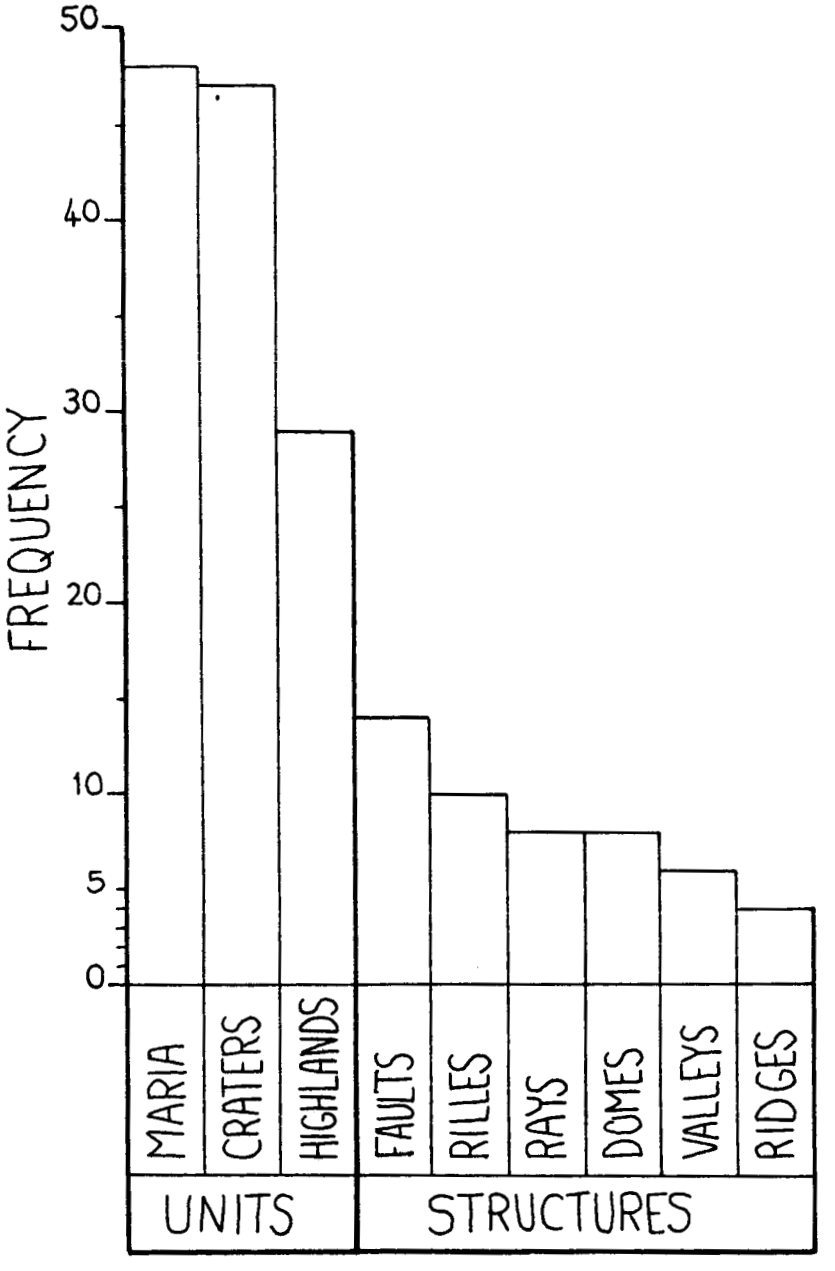

Figure 4. Cumulative graph showing the frequency of major lunar surface features and structures in seventy-seven sites.